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Improving Operational Performance and Sustainability in an Auto Paint Shop through the Implementation of an Integrated Quality Management System

Aurel Mihail TÎȚU [1] *, Doina BANCIU[2], Alina Bianca POP[3], Mihai DRAGOMIR[4], Constantin OPREAN [5]
[1] Lucian Blaga University of Sibiu, 10 Victoriei Street, 550024, Sibiu, Romania; ORCID No. 0000-0002-0054-6535; mihail.titu@ulbsibiu.ro (corresponding author)
[2] Academy of Romanian Scientists, 3 Ilfov Street, 050094 Bucharest, Romania, banciu.doina@gmail.com
[3] Technical University of Cluj-Napoca, 62A Victor Babes Street, 430083, Baia Mare, Romania; ORCID No. 0000-0002-4784-8485; bianca.bontiu@gmail.com
[4] Technical University of Cluj-Napoca, 103-105 Muncii Blvd, 400641, Cluj Napoca, Romania; ORCID No. 0000-0003-0561-4274; mihai.dragomir@muri.utcluj.ro
[5] Lucian Blaga University of Sibiu, 10 Victoriei Street, 550024, Sibiu, Romania; ORCID No. 0000-0002-1710-0660; constantin.oprean@ulbsibiu.ro

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Abstract: This paper investigates methods for optimizing the quality management system in an auto paint shop in Sibiu County, with the main theme being defect reduction and operational efficiency improvement. The research focuses on identifying problems caused by human errors, the lack of clear quality standards, and an inadequate process monitoring system, which lead to frequent defects and negative monetary impact. The key message conveyed is that, by adopting modern methodologies such as "zero defects" and "Kaizen," the paint shop can achieve a higher level of performance and customer satisfaction. The paper's aim is to propose a pragmatic framework for implementing an integrated quality management system, contributing to the long-term viability of the business. The research questions address how the implementation of these systems can influence cost reduction, quality improvement, and increased competitiveness. The research design is qualitative, based on an analysis of the existing situation, SWOT evaluation, and the proposal of concrete solutions. The paper details a comprehensive quality program, specific strategies, and measures, including the application of 5S principles. Expected results include a significant reduction in defects, streamlined execution times, and a notable increase in customer satisfaction, transforming the paint shop into a regional leader through operational excellence.

Keywords: Quality management, Kaizen, Zero defects, ISO 9001, ISO 14001, ISO 45001, Car painting.

Introduction

In a dynamic and highly competitive market, quality is a fundamental pillar for the success and differentiation of any organization. In the automotive industry, a sector where safety, reliability and customer satisfaction are paramount, maintaining high quality standards is essential. The specialized literature abounds in studies that emphasize the importance of quality management, statistical process control and continuous improvement philosophies. Authors such as Juran, Deming, Feigenbaum, Crosby, Ishikawa, Moiler and Peters have contributed significantly to the development of total quality concepts and to the substantiation of the need for a preventive approach to the detriment of the corrective one. Recent works, such as those of Francisco et al. (2024) and Ispas et al. (2023), address

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the implementation and improvement of integrated management systems, and the study of López-Figueroa et al. (2024) explores the link between leadership, employee involvement and customer satisfaction in TQM organizations. International standards such as ISO 9001 (2015), ISO 14001 (2015) and ISO 45001 (2018) are widely recognized as benchmarks for operational excellence and sustainability.
The absence of an integrated quality management system can generate significant costs, delivery delays, decreased customer trust, and, implicitly, a loss of market competitiveness. Case studies, especially those from technologically complex sectors like auto painting, reveal specific challenges related to the high number of defects and rejections in finished works, caused by human errors, a lack of clear standards, and an inefficient monitoring system. These problems lead to unexpected expenses through additional material usage, time consumption, and intensive human resource involvement, directly affecting profitability. Therefore, an in-depth analysis and the proposal of concrete solutions to remedy these deficiencies are imperative.

Although there is a vast literature on quality management and the implementation of ISO standards, concrete case studies, such as those conducted by Betegon et al. (2021), Martínez-Zarzuelo, Rodríguez-Mantilla & Fernández-Díaz (2022), or Arhin & Cobblah (2024), which offer a detailed analysis of the direct and measurable impact of implementing an integrated system in a specific auto paint shop, are less frequent. A major gap lies in detailing the practical implementation of methodologies like Kaizen and "zero defects" in a smaller business context with limited resources. Furthermore, the explicit correlation of total quality principles with the specific policies of such an organization, providing a step-by-step guide for application, represents an area that requires deeper exploration.

The originality of this research lies in applying an integrated approach, combining SWOT analysis with detailed proposals for a comprehensive quality program, specific strategies, and concrete improvement measures, adapted to the needs of an auto paint shop in Romania. The novelty resides in developing an implementation plan for the Kaizen methodology through the lens of the "8 Muda" and "5S" principles, illustrated with relevant visual examples from the analyzed work environment, offering a practical and replicable guide. Additionally, the paper proposes a model for integrating ISO 9001 (2015), ISO 14001 (2015), and ISO 45001 (2018) standards, emphasizing the synergistic benefits of this approach for a business in this field.

The main objectives of this research are:

- Identifying and analyzing the current deficiencies of the quality system in an auto paint shop.
- Formulating a clear quality policy and measurable objectives for performance improvement.
- Proposing and detailing concrete strategies and measures for defect reduction, optimization of execution times, and increased customer satisfaction.
- Arguing for and exemplifying the application of total quality principles and the "zero defects" strategy within the paint shop's context.
- Developing a detailed proposal for implementing Kaizen management, including the "5S" methodology, with practical examples.
- Presenting the stages and benefits of implementing an integrated quality management system, based on ISO 9001, ISO 14001, and ISO 45001 standards.

The paper is structured into eight sections, each addressing an essential component of the quality management system. The Introduction presents the context, the necessity of the study, its originality, and research objectives. The next section offers a detailed presentation of the company analyzed, including a SWOT analysis. Then it is proposed a comprehensive quality program, with policies, objectives, activities, strategies, and improvement measures. The following section explores the concept of total quality and the "zero defects" strategy. Next section comments on the principles of total quality and

correlates them with the company's policies. Then it is detailed the implementation of Kaizen management and the "5S" methodology. The following section presents the proposal for implementing an integrated quality management system according to ISO standards. The paper concludes with the last section, which includes the conclusions and original contributions.

Organizational framework: Auto Paint Shop MRK

This section provides an overview of Auto Paint Shop MRK, a company established in 2020 in Sibiu County, specializing in auto painting and body repair services. Despite the initial context marked by the global pandemic, the company managed to adapt and strengthen its market presence.

Auto Paint Shop MRK offers a full range of services, including car painting, body repairs and restorations, as well as car part assembly and disassembly. The team consists of six employees with well-defined roles: a panel beater responsible for body repairs and restorations, a painter, a parts preparer who handles pre-painting preparations, a car parts assembly and disassembly specialist, and two owners, one dedicated to managing operations and client relations, and the other involved in various production activities like sanding and parts preparation. The company aims to provide fast and efficient solutions for every type of car job.

The clientele is diverse, including both individuals and companies. Primarily, the company collaborates with insurance companies, receiving work from car accidents managed through various insurance firms. Long-term relationships with insurance companies are a significant factor in the company's activity. Another important client segment consists of individuals seeking solutions for various car issues, from minor dents and accidents to larger body damage. Car rental companies also represent an important client type; they operate large vehicle fleets and rely on quality services to maintain their vehicles in impeccable condition.

Auto Paint Shop MRK holds a stable and respectable position in the competitive Sibiu market, although it is not among the top market leaders. The company has carved out its own niche by focusing on accident-related auto repair works through collaborations with various insurance companies. Accessible and reliable services have solidified a loyal customer base.

Strategic SWOT analysis and optimization directions

The SWOT analysis identified the following aspects (Table 1):

- Strengths: Diverse clientele (insurance companies, individuals, car rental companies), personalized services, experience in auto repairs, qualified staff with continuous training.
- Consolidation Proposals: Implementing a loyalty program, creating a dedicated consulting system, promoting auto repair experience, implementing an employee motivation and reward system.
- Weaknesses: Defective communication among employees, leading to errors and delays, appearance of defects before delivery, affecting customer satisfaction, lack of a clear marketing strategy, limited resources for development and modernization.
- Elimination Proposals: Training employees in communication techniques, implementing a rigorous pre-delivery quality control system, developing a structured marketing plan, identifying additional funding sources.
- Opportunities: Local market expansion by attracting new clients from adjacent areas or additional sectors (freight transport, car fleets), adoption of innovative technologies to improve efficiency and quality.Harvesting Measures: Diversifying

the service portfolio and increasing visibility through marketing, investing in modern equipment.

- Threats: Strong local competitors, economic fluctuations, and market uncertainty (rising material prices, decreasing demand).
- Counteraction Measures: Increasing differentiation through quality and personalized services, diversifying revenue streams, and seeking strategic partnerships.

Table 1. SWOT analysis

SWOT Aspect	Brief Description	Key Proposals / Measures
Strengths	Diverse clientele, personalized services, experience, qualified staff.	Customer loyalty, dedicated consulting, promoting experience, employee motivation.
Weaknesses	Deficient communication, pre-delivery defects, lack of marketing strategy, limited resources.	Communication training, rigorous quality control, marketing plan, additional funding.
Opportunities	Local market expansion, adoption of new technologies.	Service diversification, marketing visibility, investment in modern equipment.
Threats	Local competitors, economic fluctuations.	Differentiation through quality, revenue diversification, strategic partnerships.
General Improvement Proposals	N/A	Regular meetings for internal communication, rigorous pre-delivery inspection, online marketing strategy and collaborations.

(Source: original contribution)

Proposals for improvement also include regular team meetings to improve internal communication, a more rigorous pre-delivery inspection system and a marketing strategy with a focus on online promotion and strategic collaborations.

Quality management program

The following details a comprehensive quality program, essential for the continuous improvement of MRK Car Refinishing.

Quality policy: Fundamentals and commitments

The quality policy of MRK Auto Paint Shop is centered on customer satisfaction and the continuous improvement of processes and products. The commitment includes maintaining and developing its market position by adhering to high quality standards, efficient management, and close collaboration with all involved stakeholders. A preventive approach is adopted, focusing on anticipating and preventing problems rather than correcting them afterwards, which reduces costs and lost time. Costs, delivery times, and service performance are respected, in an integrated approach that balances price, speed, and quality. The organization's success depends on the collaboration between management and employees, through a mixed (directive and participative) approach that encourages innovation and creative solutions. Effective collaboration with suppliers and customers is essential for maintaining high quality standards. An adequate information system allows for real-time process monitoring, data collection, and informed decision-making, ensuring efficient communication between departments. Continuous improvement is a philosophy integrated into the organizational culture. The company is also committed to protecting the environment using ecological products and processes

with minimal impact. Through these commitments, Auto MRK aims to build long-term relationships with customers and become a leader in the field.

Quality objectives: Definition and quantification

The following objectives have been established (Table 2):

- Short-term:
  - A 25% reduction in the number of defects compared to last year, from an average of seven defects per month to at most five defects per month. This aims to improve the quality of work and reduce additional costs.
  - A 20% reduction in the execution time for standard auto painting jobs, from 5 to 4 days per standard job. The goal is to streamline the process without compromising quality or safety.
  - Increasing customer satisfaction from 4.2 to 4.5 out of five by the end of this year, measured through feedback surveys.
- Long-term: Becoming a regional leader in the auto painting sector, by increasing the number of active customers by 20% compared to the previous year and achieving a market share of 15% within the next 2 years

Table 2. Quality objectives

Objective	Term	Description / Target
Decrease in the number of defects	Short-term	25% reduction (from 7 to at most 5 defects per month).
Reduction of execution time	Short-term	20% decrease (from 5 to 4 days per standard job).
Increase in customer satisfaction level	Short-term	Increase to 4.5 out of 5 (from 4.2) by the end of the year.
Becoming a regional leader in auto painting	Long-term	20% increase in active customers and achieving a 15% market share within the next 2 years.

(Source: original contribution)

Operational activities for objective attainment

To achieve the objectives, the following activities are proposed (Table 3):

- For reducing the number of defects: Implementing rigorous quality verification steps after each critical stage of the painting process (surface preparation, primer application, paint application, parts assembly); training staff to recognize and remedy potential errors.
- For reducing execution time: Optimizing workflow by reorganizing the space; investing in modern equipment that significantly reduces paint application and drying time.
- For increasing customer satisfaction: Improving communication with customers before, during, and after the painting process; personalizing services based on each customer's needs; training staff in relational skills; implementing an efficient feedback collection system; improving the quality of materials and equipment used; reducing delivery time by optimizing workflows; constantly monitoring the performance of services offered.
- For becoming a regional leader: Consistent investments in state-of-the-art equipment and eco-friendly technologies to differentiate the company in the market; actively promoting the brand through marketing campaigns focused on quality and sustainability; expanding the service portfolio to cater to a wider customer base; establishing strategic partnerships with local and regional auto dealers.

Table 3. Activities for each objective

Objective	Key Activities
Decrease in the number of defects	Rigorous quality verification after each critical stage; training staff for error identification and remediation.
Reduction of execution time	Workflow optimization through space reorganization; investments in modern painting and drying equipment.
Increase in customer satisfaction	Improved communication and service personalization; efficient feedback collection.
Becoming a regional leader	Investments in eco-friendly equipment and technologies; brand promotion through marketing.

(Source: original contribution)

Quality management strategies

The proposed strategies are (Table 4):

- Continuous process improvement strategy: Introducing the Kaizen system; staff training; post-project analyses; implementing rigorous quality verification steps; adopting ISO 9001 standards.
- Staff training and development strategy: Continuous training of employees in the use of modern equipment and painting technologies; creating an internal certification program; motivating employees through rewards for exceptional contributions to quality.
- Technological investment strategy: Acquiring automated painting equipment to reduce variability and improve precision; adopting digital solutions for job tracking and quality control; implementing eco-friendly solutions, such as water-based paints, to attract environmentally conscious customers.
- Customer-oriented strategy: Establishing clear procedures for handling customer complaints and resolving them quickly; implementing an open communication system to inform customers about job progress; customizing services to specifically meet each customer's needs.

Table 4. Quality strategies

Strategy	Key Components
Continuous process improvement	Introduction of Kaizen; staff training.
Staff training and development	Continuous training in new equipment and technologies; internal certification program.
Technological investments	Acquisition of automated equipment; digital solutions for work tracking and quality control.
Customer orientation	Clear complaint handling procedures; open communication system.

(Source: original contribution)

Specific measures for quality improvement

Specific measures include:

- For reducing the number of defects: Training sessions to improve employee concentration; rewards for employees who work carefully and avoid mistakes; clear task allocation for maintaining order and cleanliness; reorganization of existing space; implementation of a quality control system at each stage of the process; regular staff training to learn new techniques and prevent errors.
- For reducing execution time: Quality control at each stage to quickly detect and correct problems, avoiding time-consuming reworks ; use of UV lamps to accelerate paint drying ; ensuring each employee knows the exact steps and time

allocated for each activity ; preparation of necessary materials before starting work ; accessible arrangement of all tools and materials to avoid time wasted searching ; dividing activities into precise stages and creating a clear plan for each job with accurate execution time estimates ; rapid intake and scheduling of works to maximize efficiency, avoiding equipment or personnel downtime.

- For increasing customer satisfaction: Adherence to clear delivery deadlines ; transparent communication with clients ; use of modern equipment and superior quality materials for a perfect finish ; offering exterior and interior car cleaning services for impeccable delivery ; providing discounts or additional services for loyal customers ; encouraging customer reviews on trusted platforms like Google Reviews, Facebook, or other relevant auto industry websites ; contacting customers by phone or personalized message after work completion for feedback.
- For becoming a regional leader: Investments in advertising campaigns (online, social media, local publicity); promotion of services through collaborations with auto dealers and service centers; collaboration with large car fleets; participation in auto fairs and events to increase visibility and attract new clients; offering a wide range of services, from standard painting to customized painting.

These elements are synthesized in Table 5, which correlates the objectives with the proposed activities, strategies, and measures.

Table 5. Correlation table of objectives, actions, strategies, and measures

Objective	Activities	Strategies	Measures
Reducing the number of defects by 25% compared to last year	Implementing rigorous quality verification steps after each critical stage; Training staff to identify and remedy potential errors	Continuous process improvement strategy; Staff training and development strategy	Training sessions; Rewards for avoiding mistakes; Implementing a quality control system at each stage; Organizing the workspace
Reducing execution time for standard auto painting jobs from 5 to 4 days	Optimizing workflow by reorganizing space; Investing in modern equipment to reduce paint application and drying time	Technological investment strategy	Using UV lamps for rapid drying; Organizing tools and materials; Creating a clear plan for each job
Increasing customer satisfaction to a score of 4.5 out of five	Improving communication with customers; Personalizing services; Implementing an efficient feedback collection system	Customer-oriented strategy	Adhering to delivery deadlines; Using modern equipment; Offering additional services and discounts to loyal customers; Collecting customer reviews
Becoming a regional leader in auto painting with a 15% market share	Investing in state-of-the-art equipment and eco-friendly technologies; Expanding the service portfolio; Establishing strategic partnerships	Technological investment strategy	Advertising campaigns; Participation in auto fairs; Collaborations with fleets and auto dealers; Offering personalized services

(Source: original contribution)

Total quality and the "Zero defects" paradigm

Conceptual delineations: Quality versus total quality

- Quality refers to the characteristics of a product, service, or process that satisfy customer requirements, often defined by conformity to technical standards and specifications.
- Total Quality Management (TQM) is a broader approach that integrates quality into every aspect of the organization, involving all employees, processes, and procedures, with the aim of achieving customer satisfaction and continuous improvement. The "zero defects" principle implies performing all activities correctly the first time and every time, without errors, achieved through systematic preventive actions by all personnel. The concept of "internal client" and "internal supplier" promotes the idea that every employee of a firm is both an internal client and an internal supplier, contributing to the efficiency of the entire organization.

Table 6. The concept of quality versus total quality, from the author's perspective

Aspect	Quality (Traditional)	Total Quality (TQM)
Definition	Characteristics of the product/service that satisfy customer requirements, in conformity with technical standards and specifications.	Broad approach, integrating quality into every aspect of the organization, involving all employees, processes, and procedures for customer satisfaction and continuous improvement.
Focus	The final product.	The entire process (internal and external), relationships with suppliers and customers, organizational culture.
Objective	Conformity of the product/service with specifications and meeting customer requirements.	Continuous improvement and active involvement of the entire organization.
Responsibility	Usually attributed to production, engineering, or quality control departments.	Distributed to all employees, regardless of hierarchical position ("internal supplier" and "internal customer").
Client Concept	The "final beneficiary" of the product or service.	Extended: includes final customers, internal customers (employees), and external suppliers.
Error Approach	Focus on correcting problems after they appear.	Prevention of errors before they appear ("zero defects").

(Source: original contribution)

From the author's perspective, total quality is an organizational philosophy that requires cultural change, transforming all employees into responsible parties for quality and promoting continuous process monitoring to prevent errors. The fundamental difference lies in the fact that, while traditional quality focuses on the final product, total quality is a comprehensive organizational strategy that aims at improving internal processes, relationships with suppliers and clients, and organizational culture, with the goal of continuous improvement and active involvement of the entire organization. Responsibility for quality is distributed to all employees in TQM. The concept of the client is extended in TQM, including final clients, internal clients, and external suppliers.

Managerial perspectives and fundamental arguments

Renowned experts have developed the concepts of total quality management:

- Juran focused on quality planning and associated costs.
- Deming promoted management philosophy and management responsibility for quality, introducing the "Quality Wheel" (Plan-Do-Check-Act).
- Feigenbaum introduced the concept of Total Quality and Total Quality Control (TQC).
- Crosby emphasized the importance of defect prevention and the "zero defects" objective.
- Ishikawa highlighted the importance of education as the foundation of quality, introduced the concept of "internal client," and the Cause-Effect diagram (fishbone diagram).
- Shewhart laid the foundations of statistical quality control.
- Taguchi focused on product design quality and the quality loss function.
- Shingo introduced the "Poka-Yoke" concept (human error prevention).
- Imai promoted the KAIZEN philosophy, focused on continuous improvement in small steps and the elimination of losses (MUDA).
- Kano developed the KANO Model, which highlights how customer satisfaction is influenced not only by explicit requirements but also by implicit needs.

These contributions demonstrate that quality management requires the involvement of all organizational levels and a long-term strategic vision. Middle managers are responsible for developing their subordinate personnel and guiding them in their activities.

Defect prevention: Concept and applicability

The concept of defect prevention refers to implementing initiative-taking measures to avoid the appearance of problems or defects in a product, service, or process before they become evident. It is based on identifying and correcting the root causes of defects, significantly reducing the costs associated with error correction, and ensuring consistent and reliable quality. Prevention utilizes techniques such as risk analysis, continuous employee training, process improvement, and the application of quality standards. Philip Crosby, through his well-known motto "Quality does not have to be controlled, it has to be achieved," emphasizes that a rigorous control system can only detect non-quality, whereas prevention is essential for achieving adequate quality. Prevention costs are much lower than correction costs.

Analysis and quantification of non-quality

Non-quality refers not only to the absence of desired characteristics or defects but also to the excess of quality (over-quality or "overengineering"). A product is considered non-quality in the classic sense when it does not meet minimum requirements or customer specifications. Over-quality occurs when additional features are added to the product that are not necessary or do not provide a significant benefit to the customer but incur significant additional costs. The objective of quality management should be to satisfy customer requirements at the lowest possible cost, without adding unnecessary value. Organizations must adopt a "just enough" mentality to prevent non-quality, identifying and implementing only what is necessary to meet customer needs.

Principles of total quality: Analysis and contextual correlation

The principles of total quality provide an essential framework for the continuous improvement of processes, products, and services. They guide organizations towards sustainable practices and excellence. Figure 1 schematically illustrates these principles.

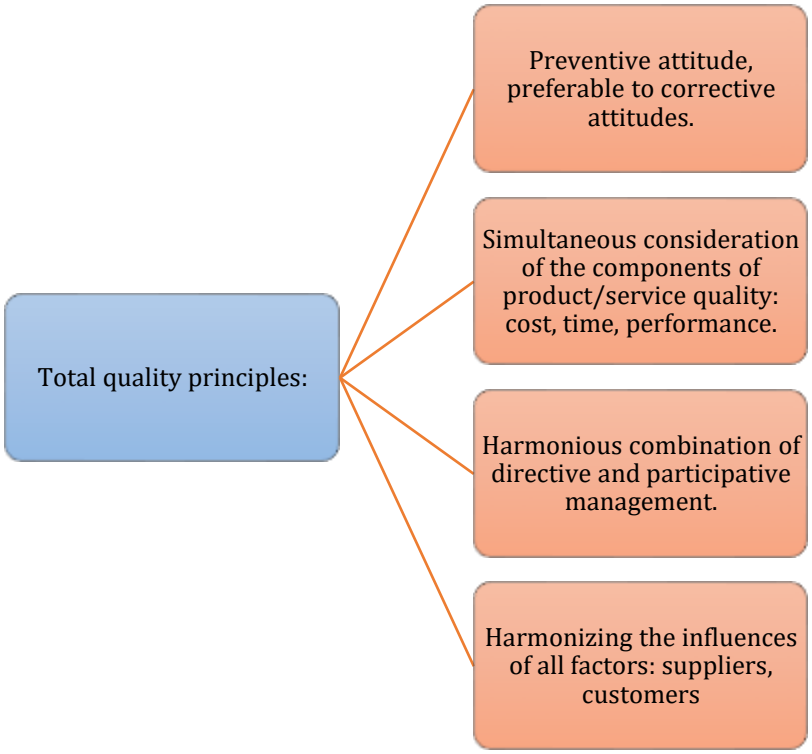
Total quality principles:
Preventive attitude, preferable to corrective attitudes.
Simultaneous consideration of the components of product/service quality: cost, time, performance.
Harmonious combination of directive and participative management.
Harmonizing the influences of all factors: suppliers, customers

Figure 1. Principles of Total Quality
(Source: original contribution)

Preventive attitude, preferred over corrective attitudes:

This principle emphasizes the importance of preventing problems before they arise, through careful planning and risk identification. This reduces the costs of subsequent corrections, improves process efficiency, and protects the organization's reputation by consistently delivering quality products and services. MRK Auto Paint Shop's policy emphasizes adopting a preventive attitude, focusing on anticipating and avoiding defects before delivery, thus ensuring consistent quality of service.

Simultaneous consideration of product/service quality components: cost, deadline, performance:

This principle implies that all three essential components of a product or service – cost, delivery time, and performance – must be considered together. The emphasis is on finding a balance among them, without compromising one at the expense of the others. A balanced approach to costs, delivery times, and performance ensures products and services that meet customer expectations, maintain market competitiveness, and allow the organization to achieve sustainable long-term results. The company's policy addresses this integrated component through balanced cost management, adherence to delivery deadlines, and guaranteeing a high-performance service, optimizing processes to efficiently meet customer requirements.

Harmonious association of directive management with participative management:

This principle emphasizes combining a clear directive leadership style – based on clear objectives, precise directives, and control – with the active involvement of employees in decision-making. Participative management leverages employees' ideas and experience, motivating them to actively contribute to quality improvement. This combination allows for aligning strategic management objectives with employee needs and contributions, motivating the team, enhancing innovation, and creating a collaborative work

environment where employees feel involved and valued. MRK Auto Paint Shop adopts a participative management approach, encouraging collaboration with employees for innovative solutions and continuous improvement of service quality.

Harmonization of the influences of all factors: suppliers, clients, ...:

Total quality can only be achieved through effective collaboration among all actors involved in the process: suppliers (who provide resources), clients (who define requirements), and other stakeholders. This principle emphasizes the importance of a well-coordinated flow of information and processes among all these factors. Good coordination among all involved factors – suppliers, clients, and other partners – contributes to creating an integrated value chain, reduces risks, improves collaboration, and ensures consistent quality delivery throughout the process. The company's quality policy highlights the importance of effective collaboration with suppliers and clients. In the painting process, superior quality materials are used, and constant feedback is gathered from clients to adapt services according to their needs and expectations. This harmonization of influences contributes to maintaining high quality standards.

Development of an adequate information system:

Total quality requires a well-established system for collecting, analyzing, and distributing relevant information. This principle involves using appropriate technology and tools to support data-driven decision-making. A well-designed information system supports real-time data-driven decision-making, improves transparency, allows performance monitoring, and contributes to the continuous optimization of processes and products offered. MRK Auto Paint Shop uses an advanced information system that monitors each stage of the painting process in real-time, facilitating the collection of relevant data and informed decision-making. The system enables efficient communication between departments and ensures adaptability and continuous process improvement, essential for maintaining an important level of quality.

In conclusion, MRK Auto Paint Shop's quality policy is aligned with these fundamental principles, contributing to operational excellence, customer satisfaction, and a strong market position.

Table 7. Principles of total quality and their correlation with MRK Auto Paint Shop's policy

Principle of Total Quality	Correlation with Auto Paint Shop MRK's Policy
Preventive Attitude	Emphasis on anticipating and preventing defects before delivery.
Simultaneous Consideration: Cost, Deadline, Performance	Balanced management of costs, adherence to deadlines, and high performance.
Association of Directive with Participative Management	Participative approach, collaboration with employees for innovative solutions.
Harmonization of Factor Influences (Suppliers, Clients)	Effective collaboration with suppliers and clients for quality materials and feedback.
Development of an Adequate Information System	Utilization of an advanced information system for monitoring and informed decisions.

(Source: original contribution)

Implementing Kaizen management and its involvement in quality policy

Kaizen is a philosophy of continuous improvement, involving the optimization of all aspects of the organization, from production to management, through the involvement of all levels. The primary objective is to eliminate waste and streamline business processes, being linked to Lean Manufacturing principles. The method, initially adopted by Toyota in

the postwar period, quickly spread globally. Kaizen is based on the idea of daily improvement, not only to increase productivity but also to create a more humane work environment. Kaizen practices eliminate heavy and stressful work ("muri") and promote the use of scientific methods for experimentation and identifying waste in processes. These processes are easily adaptable and can be implemented long-term.

The 8 MUDA (types of waste)

Figure 2 illustrates the eight types of waste:

- Excess Production / Overproduction: Producing more than necessary, leading to high inventory, additional storage costs, handling, and distribution.
- Inventory / Stock: Large inventory can represent significant waste, as resources are tied up in products not immediately used, creating storage costs and risks of damage or perishability.
- Waiting Time: Waiting is a form of waste when there are periods of inactivity for both employees and equipment, delaying the entire production flow and contributing to inefficiency.
- Defects: Products that do not meet quality standards, requiring repairs or rework, generating additional costs, lost time, resources, and customer dissatisfaction.
- Unnecessary Movements: Refers to any movement of employees or equipment that does not add value to the production process, reducing efficiency and increasing accident risks.
- Over-processing: Occurs when more steps or adjustments are made than necessary to meet customer requirements, consuming resources without adding value to the final customer.
- Transportation: Unnecessary movement of materials or products between locations, incurring costs for fuel, time, human resources, and risks of product damage.
- Underutilization of Talent: Refers to not realizing the full potential of employees, affecting morale, and potentially leading to lost innovation opportunities.

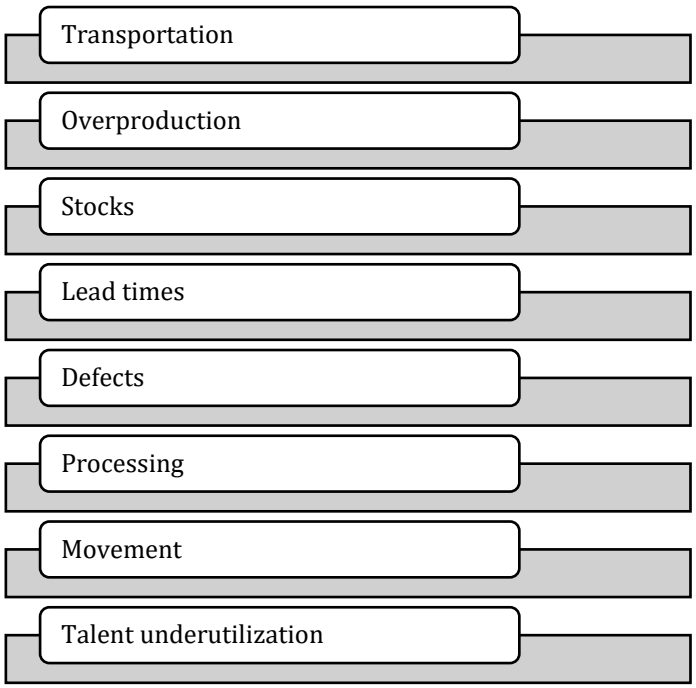

Figure 2. The 8 MUDA
(Source: original contribution)

Kaizen Principles: Implementing Kaizen involves all employees. The methodology is based on "small experiments," where changes are implemented quickly, and results are monitored and adjusted based on feedback, without rigid planning. Fundamental principles include:

- Continuous Improvement: Small and constant steps lead to significant long-term progress. This approach helps organizations remain competitive and adapt to market changes.
- Commitment of All Employees: Kaizen encourages the active involvement of all team members in the improvement process. Each team member is encouraged to identify improvement opportunities and participate in their implementation, leading to increased responsibility and job satisfaction.
- Fact and Data-Based Thinking: Decisions within Kaizen are based on objective analyses and concrete data, not assumptions or individual opinions. This approach ensures efficient and measurable solutions for identified problems.
- Systems and Process Approach: Kaizen promotes a holistic view of the organization, understanding that each process is interconnected. Thus, improvements are implemented at the system level, not just at the departmental level, to maximize efficiency and reduce waste.
- Creation of a Balanced and Stable Work Environment: Kaizen emphasizes process stability and the creation of a harmonious work environment where employees feel valued and motivated. This contributes to reducing employee turnover and increasing team cohesion.

The "5S" Method in the Auto Paint Shop: Kaizen and "5S" are linked, with "5S" supporting the implementation of continuous improvement at the workplace level. The "5S" method consists of five stages (figure 2):

- Sort (Seiri): Eliminate what is not necessary from the workspace.
    - Concrete steps: Organize an evaluation session with all six team members to inspect the paint shop. Label unnecessary items (e.g., "Keep," "Discard," "Move"). Remove waste, expired materials, non-functional tools, or other items not directly contributing to the process.
- Set in Order (Seiton): Organize for efficiency by placing each item in the most suitable location to reduce lost time and accident risk.
    - Concrete steps: Label locations for all equipment (e.g., paint shelves, spray gun holders). Implement a color code to quickly identify several types of paints or equipment. Create visual maps (diagrams on walls) to show where each item is located.
- Shine (Seiso): Ensure a clean and maintained environment for safety and efficiency.
    - Concrete steps: Clean all surfaces (walls, floors, workbenches, equipment). Define cleaning responsibilities for each employee. Establish a daily cleaning routine.
- Standardize (Seiketsu): Create clear rules and procedures to ensure all processes are clearly defined and consistently followed.
    - Concrete steps: Write clear procedures (e.g., how to prepare surfaces for painting, how to clean equipment after use). Document rules using visible posters for essential steps. Standardize the organization so all paints, tools, and equipment are in the same place, regardless of who is working.
- Sustain (Shitsuke): Maintain improvements and transform the 5S method into a daily habit.
    - Concrete steps: Establish periodic meetings (monthly) to evaluate adherence to rules and adjust. Constantly gather feedback from the team for improvements. Monitor indicators (e.g., preparation time for a job, number of workplace accidents).

Activity Implementation: Initial training for all employees, step-by-step practical applications, continuous monitoring with individual responsibility.

Results Achieved: Better organized space reduced lost time, increased productivity and quality, reduced accident risks, more engaged and responsible employees.

The images "Before 5S," "After Sorting," "After Setting in Order," and "After Shining" illustrate the progressive transformation of the workspace.

Table 8. The "5S" Method and its applicability

Main Action	Key Steps Examples in Auto Painting
Sort (Seiri)	Eliminating the unnecessary.
Set in Order (Seiton)	Organizing for efficiency.
Shine (Seiso)	Cleanliness and maintenance.
Standardize (Seiketsu)	Creating rules and procedures.
Sustain (Shitsuke)	Maintaining improvements.
General Benefits	Organized space, increased efficiency.

(Source: original contribution)

Integrated Quality Management System: Implementation and benefits

Implementing an Integrated Management System (IMS) is essential for optimizing processes, meeting customer expectations, and ensuring legal and environmental compliance. IMS consolidates multiple systems (quality, environmental, occupational health, and safety) into a coherent structure, reducing redundancies, improving operational efficiency and compliance, lowering costs, and increasing customer satisfaction. Although MRK Auto Paint Shop currently lacks such a system, there is significant potential for implementing recognized international standards. Table 9 schematically presents an integrated management system.

Table 9. Implementation of an Integrated Management System

Standard	**Domain**	**Key Objectives**	**Main Benefits**
ISO 9001:2015	Quality Management	Customer satisfaction, continuous improvement, conformity.	Increased customer satisfaction, operational efficiency, competitive advantage, credibility.
ISO 14001:2015	Environmental Management	Reducing environmental impact, legal compliance, sustainability.	Improved image, legal conformity, cost reduction, pollution prevention.
ISO 45001:2018	Occupational Health and Safety (OHS)	Reducing OHS risks, accident prevention, safe work environment.	Reduced risks and delays, safe work environment, improved reputation, savings.

(Source: original contribution)

Relevant Standards:

- SR EN ISO 9001:2015 - Quality Management Systems. Requirements:

Defines the requirements for a quality management system that ensures products and services meet customer requirements, applicable regulations, and continuously improve internal processes.

  - Objectives: Ensuring customer satisfaction by consistently delivering products and services that meet requirements, as well as applicable legal and regulatory requirements. It aims for continuous improvement of organizational performance through a process-based approach that optimizes interactions between processes and resources. It also emphasizes fact-based decision-making and creating an environment where employees are actively involved in achieving organizational objectives. ISO 9001:2015 promotes a strategic vision in managing relationships with interested parties, contributing to increased efficiency, competitiveness, and organizational reputation.
  - Implementation Stages (14 steps): Top management commitment, establishing the implementation team, team training, determining quality policy and objectives, planning QMS activities, analyzing existing processes, developing QMS documentation, implementing documentation, staff training, internal audits, management review, corrective and preventive actions, pre-certification, and certification.
  - Benefits: Increased customer satisfaction improved operational efficiency and cost reduction, competitive advantage in international markets, increased employee involvement and motivation, compliance with legal and applicable regulations, improved relationships with suppliers and partners, promotion of a culture of continuous improvement, and increased credibility and market image.
- SR EN ISO 14001:2015 - Environmental Management Systems. Requirements with guidance for use:

This is an international standard that specifies requirements for an environmental management system, helping organizations reduce the environmental impact of their activities, improve environmental performance, and ensure compliance with applicable environmental legislation.

  - Objectives: Reducing risks and environmental impact through efficient resource management, minimizing pollution, and protecting the environment. It also aims for continuous improvement of environmental performance through constant monitoring of activities and identification of improvement opportunities. Another important objective is ensuring compliance with legal environmental regulations. Additionally, ISO 14001:2015 promotes sustainability, encouraging responsible environmental behavior and integrating best ecological practices into organizational processes.
  - Implementation Stages (9 steps): Initial analysis, management commitment, planning, documentation development, system implementation, monitoring and evaluation, management review, certification, and continuous improvement.
  - Benefits: Improved organizational image and increased market share , compliance with legal requirements and reduced risks of non-compliance , reduced operational costs through efficient resource utilization , attracting ethical investments and improving relationships with stakeholders , reduced insurance risks and associated costs , improved environmental performance and pollution prevention , competitive advantage and access to international markets , and increased employee involvement and motivation.

- SR ISO 45001:2018 - Occupational Health and Safety Management Systems. Requirements with guidance for use:

This is an international standard dedicated to occupational health and safety (OHS) management systems, designed to help organizations create a safe and healthy work environment, preventing work-related accidents, occupational diseases, and incidents related to employee safety.

  - Objectives: Reducing risks associated with occupational health and safety and preventing work accidents and occupational diseases through an initiative-taking and preventive approach. The standard also aims to ensure compliance with legal and regulatory requirements in the OHS field and to improve organizational performance through efficient resource and risk management. Furthermore, it promotes the creation of a safe and healthy work environment through management and employee involvement in implementing safety measures and continuous process improvement.
  - Implementation Stages (7 steps): Management commitment, identification of legal and other requirements, system planning, support and resources, operational implementation, performance evaluation, and continuous improvement.
  - Benefits: Demonstrating commitment to occupational health and safety , reducing risks and preventing production delays , ensuring a safe working environment for employees and visitors , improving reputation and increasing business opportunities , minimizing risks of activity interruption due to accidents , complying with legal obligations and current regulations , savings on insurance premiums , creating an organizational culture oriented towards health and safety , improving organizational performance and productivity , and facilitating integration with other management standards

Implementing these standards provides an integrated framework for operational excellence, sustainability, and safety, bringing tangible benefits and a durable competitive advantage.

Conclusions and original contributions

The paper highlighted that the absence of an integrated quality management system was the main cause of defects and financial losses in the auto paint shop analyzed. Implementing such a system will reduce errors and rejections, thereby increasing operational efficiency and profitability. A preventive approach will avoid additional costs, and the "zero defects" methodology will increase process reliability. Customer satisfaction is essential, being influenced by consistent quality and an effective feedback system, which will build long-term relationships with customers and attract new ones to the competitive market.

Applying Kaizen principles will develop a continuous learning and constant improvement environment, crucial in a dynamic industry. Promoting an organizational culture oriented towards excellence and defect prevention will ensure the long-term sustainability of the business. Integrating theoretical total quality concepts with daily activities, through specific tools, will create an efficient quality management system, reduce costs, and increase customer satisfaction. Continuous monitoring and evaluation of painting processes are essential for quickly detecting and correcting deviations from quality standards before they affect deliveries or customer satisfaction. These conclusions emphasize the importance of effective quality management for the paint shop's competitiveness.

Within this work, a detailed SWOT analysis of the auto paint shop was performed, identifying main strengths, weaknesses, opportunities, and threats, and concrete

improvement solutions were proposed for each. A quality policy was formulated, establishing clear objectives and specific activities for their achievement. Detailed strategies and concrete measures for quality improvement were developed. My personal perspective on the difference between the concept of quality and total quality was presented. A central aspect of the contribution was the proposal to implement the Kaizen methodology in the analyzed organization, including a step-by-step detailing of the 5S principles' application, with relevant practical examples for the paint shop. Additionally, an integrated quality management system was proposed, to include not only quality management but also environmental protection and occupational health and safety, as essential elements for supporting a high-performing and sustainable operational environment. My contributions focus on providing a complete and practical framework for improving internal processes and developing an organizational culture oriented towards excellence.

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